



## Barriers to Creative Science Teaching from the Perspectives of Science Teachers in Higher Primary Schools

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### ABSTRACT

*This study examined the barriers to creative science teaching (SCST) from the perspectives of private 103 science teachers of higher primary schools in Mysore, India. A questionnaire was used and administered to the 103 teachers selected randomly. The sample data was analyzed by using frequencies percentage, arithmetic means, and standard deviation for each item and reliability test (alpha cronbach). The findings indicate several major barriers related to teachers, parents, students and schools. Teachers repeatedly use the same teaching plan for multiple periods. They resort to explaining practical lessons theoretically. They are disinterested in getting acquainted with new researches and studies related to modern teaching methods. They are unfamiliar with the different approaches to learning such as learning styles and modalities. The in-service training programs of developing the creative teaching skills of the science teacher are insufficient. Teachers are inefficient in preparing creative activities that stimulate creative thinking. Parents do not follow up the level of progress of their children. Students compete only to obtain high ranks. Students are expected to memorize facts for passing the exams. The science laboratory lacks tools and equipments. The learning environment in the classroom does not allow students to learn in cooperative groups. Finally, the physical surrounding prevents students to move desks when situations demand.*

**Keywords :** Barriers of science teaching, Science teaching, Science teacher, Higher primary school

### Introduction

Education is one of the greatest services provided by teachers. It is vital for anything. The role played by teachers becomes a very important component and in fact it can be said that they are in a way our nation builders. Teachers work in close co-ordination with students to help them in build up their future. They mould the students to sharpen their skills and upgrade them. They teach good habits and attitudes and help students become good citizens of the nation. Primary school teaching is one of the most important professions in the world. Teachers pass on knowledge and values to children and prepare them for further education and work. Such teachers are the main contributors to good education. Unfortunately, this highly significant profession does not get the recognition it deserves.

Good teachers recognize the importance of inventiveness. Creative teachers see the development of creativity and originality as the distinguishing mark of their teaching. In order for the teacher to become creative, he will have to widen his understanding of his own creativity, and the imaginative approaches and repertoire of engaging activities that he can employ in order to develop the students' capacity for original ideas and action. He will also want to exert his professional autonomy and learn to be flexible and responsive to different learners and diverse learning contexts. For teachers to be innovative they must be reflective and analytical about teaching and learning (Committee for the Review of Teaching and Teacher Education 2003; QDEF 2003). Thus, the role of the teacher is important in teaching students how to be creative and innovative. Grainger et al, (2005) reported that confidence, enthusiasm and commitment are common qualities in creative teachers. Alkhateeb (1995: 134) notes that the creative teacher is one who uses different methods and teaching strategies, creating innovative learning environment in the classroom that help develop the students' process of thinking and improve their attitudes towards new teaching positions. Science creative teaching can only be successful if it is carried out together with the teachers themselves – if they

are part of the process and able to provide input in terms of specifying the operational and institutional requirements for the future.

There are many definitions of creative teaching, the majority of the authors who write about creative teaching avoid providing such a definition, preferring to list series of behaviors, approaches or strategies that characterize creative teaching. Paul Torrance, one of the main researchers in this field, provided a different definition. One definition is the use of creative methods and techniques as proposed by Mayer (1989): "creative teaching refers to instructional techniques that are intended to help the students learn new material in ways that will enable them to transfer what they learned to new problems" (p. 205); another is the development of students' cognitive abilities, as in Whitman's (1983) definition: "teaching students to use strategies for representing and processing new information in ways that lead to problem solving transfer" (p. 5); or Osborn's (1993), "the type of teaching which causes students to think as they learn" (p. 51). According to Torrance (1981), the purpose of creative teaching is to create a "responsible environment" through high teacher enthusiasm, appreciation of individual differences, and so on. Feldhusen and Treffinger (1980) and Davis (1991) also believed establishing a "creative climate" was important to stimulate creative thinking (cited in Fasco, 2002).

Creative teaching is associated with planning, implementation, and evaluation skills which develop creativity through learning environment that facilitates creativity. The teacher believes in innovation through the preparation of teacher in pre-service, and instructional administration provides the resources and activities that develop the creativity of the student (Mahmood, 2005: 173). Every moment, teachers are facing new challenges. They have to solve a lot of problems, which they have not been taught directly in training courses or experienced before (Cheng, 2002: 4). Hennessey and Amabile (1987) listed five methods for "killing" creativity: (a) have children work for an expected reward, (b) set up competitive

situations, (c) have children focus on expected evaluation, (d) use plenty of surveillance, and (e) set up restricted-choice situations. (Fasco, 2002: 323). Torrance reported that the greatest obstacles to creativity are: (i) lack of opportunity to use ideas or what has been learned, (ii) lack of interest in the problem, (iii) the problem is impossible, (iv) lack of challenge to one's best abilities, (v) lack of change to do things in one's own way, and (vi) lack of purposefulness (Shaughnessy, 1998: 446).

A developmental theory of creativity proposed by Renzulli (1992) suggests that students should be provided with opportunities to engage in "ideal acts of learning" (p. 171). The student, teacher, and curriculum must all be involved for these ideal acts of learning to occur. The curriculum also should emphasize the structure of a discipline, which will facilitate the students' thinking in that discipline (Renzulli, 1992). Renzulli also reported that the curriculum should be appropriately flexible to students' "unique abilities, interests, and learning styles" (p. 176). In addition, classroom activities should place the student in the role of a "professional ... inquirer" (p. 177) (cited in Fasco, 2001: 322). The atmosphere of the learning environment is also important teachers should try to create a soothing atmosphere so that students feel at ease to think creatively (Huai-en, 1). Not only is school administration responsible for develop creativity, but also we need proper educational system to foster creativity. Creative education is a systematic project which includes the reformation of examination system, the transformation of education targets, the changes of education concepts and the training of creative teachers, etc. Fasco indicated that there should be a need for courses in creativity for pre- and in- service teachers (2002: 324).

In Mysore, higher primary science teachers need creativity to develop new instructions and activities, to adapt activities in the textbooks to special classroom environment and students' needs, to motivate students cope with classroom management problems. Therefore it is necessary to identify the barriers and challenges that hamper the creative teaching of science teachers and find necessary solutions to overcome these obstacles.

#### Problem of the Study

The teachers of education labor at length on the importance of providing for individual difference, while in practice they teach the same material to all the students in class regardless of their interest and abilities (Orata, 2002: 150).

Despite constant changes in student-teacher interaction and continuous innovations in teaching methods, some obstacles remain in the way towards the implementation of creative teaching. Teachers' professional growth is already a slow process that takes a long time (Chin, Leu, & Lin, 2000), and the obstacles preventing them from implementing creative teaching are even greater. The majority of teachers still rely heavily on classroom lectures and blackboard demonstrations; most of them lack either the ability or the will to develop and utilize diversified, innovative ways of teaching. This gives us some indication of how much creative teaching is neglected in the system of school education. Therefore, it is of utmost importance to investigate and understand how creative teaching can be more widely adopted and effectively used by ordinary teachers in order to help promote the development of higher-order thinking skills in students (Hong and et al, 2004: 2). In Mysore, teachers emphasize basic knowledge and neglect the cultivation of students' creativity. Their teaching methods are always text-centered or teacher-centered, and this prevents students from being involved in activities that make students use their five senses, social skills, and thinking skills. These cause the students to study passively. Therefore, our goals of education reform are the changes from passive learning to creative learning, from text-centered or teacher-centered learning to student-centered learning.

Despite the fact that educational documents make claims for creativity in education and give several reasons for im-

plementing creative teaching and learning in schools, most schools retain too many features which are fundamentally uncreative (Lucas, 2001). The researchers attempted to determine the barriers to creative teaching that high primary science teachers confront. The researchers also attempted to put forward suggestions to overcome these barriers and contribute to the development of creative teaching in high primary school. The following questions were answered in this study: What are the barriers of the creative teaching in relation to teacher, student, curriculum, and instructional environment as perceived by the science teachers in Mysore High Primary Schools?

#### Method

##### Subjects of study

The final sample groups were composed of 103 higher primary science teachers from Mysore city.

##### Instrument of the study

The instrument used was questionnaire on Barriers to Creative Science Teaching (BCST) of science teacher. It was developed by the researchers. It consists of (64) items to which the teachers were expected to respond by expressing their level of agreement or otherwise on a five-point scale of Strongly Agree (SA) rated 5, Agree (A) rated 4, Unsure (US) rated 3, Disagree (D) rated 2, and Strongly Disagree (SDA) rated 1. These items related to the following domains are:

- (i) The barriers related to the teacher.
- (ii) The barriers related to the student.
- (iii) The barriers related to the curriculum.
- (iv) The barriers related to the instructional environment.

##### Validity and Reliability

The questionnaire was checked and validated by the subject experts, professor in measurement, professor in psychology and professor in science education to see that whether the content validity is ensured. The questionnaire items were modified according to the suggestions given by them. A pilot test involving (48) teachers was conducted to check the reliability of the items as well as to rephrase some of the items which were ambiguous. The reliability determination of the questionnaire was carried out using cronbach alpha method with the scores. The value was found to be 0.82.

##### Procedures

Teachers were met individually in group for clarifying the purpose of the study and were instructed how to respond to the instrument. Further clarifications were given on the doubts raised by them. The responses of the teachers on the instrument were scored as specified in the instrument, tabulated and subjected to statistical analysis. The survey accordingly asked respondents to identify the expected and actual impediments experienced during science teaching. Respondents were asked to rate each listed impediment on a five-point Likert scale where 1='Strongly disagree' and 5='strongly agree'.

A statistical standard was determined in order to arrange BCST items according to their severity (for interpretation of mean score, see table 1).

**Table 1: Interpretation of Mean score for BCST Items**

The Range	Degree of Agreement	Degree of Barriers
4.21-5	Strongly Agree	very strong
3.41-4.20	Agree	Strong
2.61-3.40	Unsure	Medium
1.81-2.60	Disagree	Weak
1-1.80	Strongly Disagree	Very weak

#### Findings

##### First Question

What are the BCST related to the teacher as perceived by the science teachers in Mysore Higher Primary Schools?

To answer this question, means, standard deviations and degree of barriers were used and the details are given in the

table 2.

**Table 2: Means and standard deviations of teacher's responses in respect of BCST related the teacher**

Rank Order Of the Barrier	Items of Barriers	Mean	SD	Degree of Barriers
1	Teacher's repeated use of the same teaching plan for multiple periods.	3.72	1.22	Strong
2	Teacher's resort to explaining the practical lessons in a theoretical form.	3.65	1.18	Strong
3	Teacher's disinterest in getting acquainted with new researches and studies related to modern teaching methods.	3.59	1.19	Strong
4	Teacher's low of self-esteem for using creative teaching	3.54	1.43	Strong
5	Teacher's unfamiliarity with the different approaches to learning such as learning styles and modalities.	3.48	1.04	Strong
6	The in-service training programs of developing the creative teaching skills of the science teacher are insufficient.	3.46	1.05	Strong
7	Teacher's inefficiency in preparing creative activities that stimulate creative thinking.	3.43	1.19	Strong
8	The teacher presents all materials to the class.	3.34	1.14	Medium
9	Increase in the teaching hours load on the teacher.	3.20	1.24	Medium
10	The teacher encourages students to acquire knowledge only for passing exams.	3.10	1.41	Medium
11	Weakness of pre-service teachers' preparation program in developing creative teaching skills.	2.84	1.17	Medium
12	The teacher does not use assessment results while planning.	2.63	1.19	Medium
13	The teacher cannot manage the dialogue and discussion in the classroom in an ordered way.	2.51	1.15	Weak
14	Learning activities are not suitable for students or instructional objectives and do not reflect the design quality appropriate to engage students in the work.	2.47	1.00	Weak
15	The lack of cooperation among science teachers.	2.42	1.20	Weak
16	The teachers' belief that the creative capacity of the students cannot be fostered or increased.	2.28	1.18	Weak
17	The teacher's interaction with most students is negative, demeaning, sarcastic, or inappropriate to the age of the students.	2.22	1.19	Weak
18	The teacher holds a negative attitude towards the teaching profession.	1.89	1.18	Weak
19	The teacher does not encourage students to believe in their creative potential, engage their sense of possibility, or express their thoughts freely.	1.87	0.95	Weak
20	The teacher discourages students to discuss and arise novel questions.	1.84	0.90	Weak

21	The teacher rejects the students' efforts to think creatively.	1.78	1.01	Weak
22	The teacher discourages students to be creative.	1.66	0.80	Very Weak
Total Mean of Domain		2.77	1.14	Medium

The result in the table 2 shows the means of teacher's responses in respect of BCST related to the teacher ranged from (3.72) to (1.66). The following items represent some barriers related to the teacher and hinder creative science teaching in high degree, these are "Teacher's repeated use of the same teaching plan for multiple periods", "The teacher's resort to explaining the practical lessons in a theoretical form", "Teacher's disinterest in getting acquainted with new researches and studies related to modern teaching methods", "Teacher's low of self-esteem for using creative teaching", "Teacher is unfamiliarity with the different approaches to learning such as learning styles and modalities", "The in-service training programs of developing the creative teaching skills of the science teacher are not sufficient" and "Teacher's inefficiency in preparing creative activities that stimulate creative thinking", were ranked first, second, third, fourth, fifth, sixth and seventh respectively. The total mean of BCST related the teacher is (2.77), which means that the barriers related to the teacher hinder creative science teaching in moderate degree.

### Second Question

What are the BCST related to the student as perceived by the science teachers in Mysore Higher Primary Schools?

To answer this question, means, standard deviations and degree of barriers were used and the details are given in the table 3.

**Table 3: Means and standard deviations of teacher's responses in respect of BCST related the student**

Rank Order Of the Barrier	Items of Barriers	Mean	SD	Degree of Barriers
1	Parents do not follow up the level of progress of their children.	4.03	0.85	Strong
2	Students' interactions are characterized by competition and conflict in order to obtain high ranks.	3.54	1.21	Strong
3	Students are expected to memorize facts for passing the exams.	3.50	1.41	Strong
4	Poor science background of students.	3.39	1.28	Medium
5	Students prefer the teacher's explanation of the lessons in the traditional methods	2.79	1.15	Medium
6	Students do not have courage, self-esteem during learning, and rather their sense of failure in science prevails.	2.68	1.06	Medium
7	The large numbers of students in the classroom.	2.41	1.43	Weak
8	Spread of malpractices in exams.	2.25	1.39	Weak
9	Students do not have enthusiasm, curiosity, and satisfaction towards science learning.	2.23	1.20	Weak
Total Mean of Domain		2.98	1.22	Medium

The result in the table 3 shows the means of teacher's responses in respect of BCST related to the student ranged

from (4.03) to (2.23). The following items represent some barriers related to the teacher and hinder creative science teaching in high degree, these are “The parents do not follow up the level of progress of their children”, “The students’ interactions are characterized by competition and conflict in order to obtain high ranks” and “The students’ are expected to memorize facts for passing the exams”, were ranked first, second and third respectively. The total mean of BCST related the student is (2.98), which means that the barriers related to the student hinder creative science teaching in moderate degree.

**Third Question**

What are the BCST related to the curriculum as perceived by the science teachers in Mysore Higher Primary Schools?

To answer this question, means, standard deviations and degree of barriers were used and the details are given in the table 4.

**Table 4: Means and standard deviations of teacher’s responses in respect of BCST related the curriculum**

Rank Order Of the Barrier	Items of Barriers	Mean	SD	Degree of Barriers
1	The science laboratory lacks tools and equipments.	3.49	1.17	Strong
2	Learning environment in the classroom does not allow students to learn in cooperative groups.	3.44	0.97	Strong
3	Deficiencies of Practical activities that require investigation and discovery in textbooks.	3.31	1.21	Medium
4	Overloading the curriculum with information.	3.17	1.16	Medium
5	Instructional objectives in textbooks reflect only one type of learning.	2.99	1.08	Medium
6	The methods of assessment lack congruence with instructional objectives.	2.92	0.98	Medium
7	Requirements using modern teaching methods are not available.	2.85	1.27	Medium
8	The allocated time of science period is not enough (40 minutes) for applying creative teaching methods.	2.77	1.36	Medium
9	The different units are not related.	2.75	1.16	Medium
10	The evaluation questions do not include questions that address the creative thinking abilities of students.	2.7	1.34	Medium
11	Instructional objectives do not encourage students to apply their own imaginative faculties.	2.67	1.14	Medium
12	Instructional objectives in textbooks are not aligned with student’s needs and interests.	2.64	1.08	Medium
13	The content of science lessons does not generate tendencies for scientific hobbies in students.	2.53	1.16	Weak
14	Instructional objectives of lessons do not focus on the development of the students’ creative thinking ability.	2.44	1.00	Weak
15	Inefficiency of the teacher to use the instructional media and to devise teaching aids from the available resources.	2.31	1.23	Weak
16	Materials and resources do not support the instructional objectives or engage students in a meaningful work.	2.21	1.11	Weak

17	Teachers’ complete dependence on the prescribed textbook without looking for other sources.	2.18	1.29	Weak
<b>Total Mean of Do-main</b>		<b>2.79</b>	<b>1.16</b>	<b>Medium</b>

The result in the table 4 shows the means of teacher’s responses in respect of BCST related to the curriculum ranged from (3.49) to (2.18). The following items represent some barriers related to the teacher and hinder creative science teaching in high degree, these are “The science laboratory lacks tools and equipments” and “Learning environment in the classroom does not allow students to learn in cooperative groups”, were ranked first and second respectively. The total mean of BCST related the curriculum is (2.79), which means that that the barriers related to the curriculum hinder creative science teaching in moderate degree.

**Fourth Question**

What are the BCST related to the instructional environment as perceived by the science teachers in Mysore Higher Primary Schools? To answer this question, means, standard deviations and degree of barriers were used and the details are given in the table 5.

**Table 5: Means and standard deviations of teacher’s responses in respect of BCST related the instructional environment**

Rank Order Of the Barrier	Items of Barriers	Mean	SD	Degree of Barriers
1	The physical surrounding prevents students to move desks when situations demand.	3.46	1.01	Strong
2	The accountability principle is not applied to careless teacher.	3.05	1.08	Medium
3	The educational administration does not provide the teacher with training programs for developing creative teaching skills.	2.95	1.32	Medium
4	The school administration does not encourage and reward creative teachers.	2.84	1.26	Medium
5	There are no learning programs in the school for encouraging active learning and individual interests.	2.77	1.22	Medium
6	The numbers of science periods allotted are not sufficient.	2.75	1.14	Medium
7	The weak role of the mentor and the principal to improve and enhance the teachers’ practices is observed.	2.73	1.14	Medium
8	The school management does not deal fairly with some teachers.	2.56	1.09	Weak
9	The classroom is autocratic.	2.48	1.04	Weak
10	The school administration is not sensitive to the creative needs of students.	2.42	1.30	Weak
11	The teachers’ styles of performance assessment by mentor or principal are based on the irregular observation.	2.28	1.10	Weak
12	The classroom is unsafe and the furniture arrangement is not suitable for effective learning.	2.25	0.87	Weak
13	The school building does not allow students to practice sports and social activities that develop their mental capacity.	2.14	1.15	Weak

14	The school lacks learning resources like computers and internet.	2.13	1.28	Weak
15	Teacher ignores established school rules and regulations.	2.10	0.96	Weak
16	The school administration discourages students from participating in extra-curricular activities.	2.04	1.07	Weak
<b>Total Mean of Domain</b>		<b>2.56</b>	<b>1.13</b>	<b>Weak</b>

The result in the table 5 shows the means of teacher's responses in respect of BCST related to the instructional environment ranged from (3.46) to (2.04). The following item represents barrier related to the instructional environment and hinder creative science teaching in a high degree, this is "The physical surrounding prevents students to move desks when situations demand". The total mean of BCST related the instructional environment is (2.56), which means that the barriers related to the instructional environment hinder creative science teaching in low degree.

### Discussion

As previously mentioned, there are multifaceted relationships between the barriers. Some barriers related to teacher, such as: the in-service training programs of developing the creative teaching skills of the science teacher are not sufficient; teacher's repeated use of the same teaching plan for multiple periods; teacher's inefficiency in preparing creative activities that stimulate creative thinking; teacher's disinterest in getting acquainted with new researches and studies related to modern teaching methods; and teacher's unfamiliarity with the different approaches to learning such as learning styles and modalities seem to be more significant than others.

The teachers have been attending professional development courses in science teaching methods but they did not know the creative science teaching skills because the course only focused on general teaching methods and did not address creative science teaching skills, this is why the science teachers avoid to use a variety of teaching plans. This means they use the same teaching method every class period as they are unfamiliar with different modalities. In addition, teachers do not follow up the new researches and studies related to modern teaching methods which make students to be more attentive and also increase the teachers' potential for learning as they are exposed to a wide variety of teaching methods. Also the lack of in-service training of developing the creative teaching skills leads to the weakness of the teachers in formulating creative activities in which all of students can participate in an orderly manner and stimulate their creative thinking. One finding of some studies (such as Othman, 2001; Al-Jughaiman, 2002, 2003; Al-Shabi, 2009) was that there were not enough in-service training programs of developing the creative teaching skills. Similarly, Rao (2003) found that the content and teaching methods of the subject are not covered properly in the in-service training programmes. Recent studies show that lack of resistance to change is an important factor affecting the applicant of modern teaching methods (Hommes, 1997; Cotoon, 2001; Al-Harasees, 2003; Hornig et al, 2005). Similarly, Al-Shabi (2009) found that science teachers' resistance to change concerning the use of new strategies is an obstacle to creative science teaching.

There are also some barriers related to teacher such as: teacher's low of self-esteem for using creative teaching, teacher's unfamiliarity with the different approaches to learning such as learning styles and modalities and teacher's inefficiency in preparing creative activities that stimulate creative thinking seem to be more significant than others. Teachers worry about using creative teaching because the creative teaching has higher requirements on the teachers and this requires the teachers to have more skills and creative teaching requires much time. The teachers perform practical ac-

tivities in their science lessons in a theoretical way because it is based on equipment and tools which are not available in science laboratories. Some studies such as Al-Hrasees (2003) asserted that teachers' "fear of failure" caused a lack of confidence.

Moreover, there are some barriers related to curriculum, teacher and student, such as the science laboratory lacks tools and equipments, the teacher's resort to explaining the practical lessons in a theoretical form and the students' are expected to memorize facts for passing the exams seem to be closely related to others. The parents do not take proper care of their children's progress because they are more likely to spend money for private school and tutor, so they rely on school teachers and tutor for following up their children's progress. Besides, most parents believe that they are not "trained educators" and do not speak "education jargon"; they have little of value to contribute to discussions about their child's education. The students' interactions are characterized by competition and conflict in order to obtain high ranks because they are crammed with a lot of information and knowledge and they are not provided opportunity to foster their thinking skills and develop their creativity. The teacher cannot use cooperative learning technique because the classroom environment prevents students from moving their desks. In addition students in the classroom write down the teacher's lesson content and at home they memorize it because their exam will be based on what they write and memorize. In this way, they do not have any encouragement to understand and think creatively because they are expected to memorize facts only for passing the exams.

Regarding barriers related to curriculum it was found out that in the city of Mysore most classrooms have good physical properties, but they have fixed desks in form of rows. This prevents teachers from using cooperative learning groups that encourage cooperation and communication among students which develop their social skills and creativity. This also prevents students from changing their desks while using some teaching methods that require changing student's desks such as peer teaching, learning cells, brain storm, etc. Add to that, there is a lack of tools and equipment in science laboratories which enable students to discover the facts.

A barrier which is directly related to instructional environment is the physical environment which does not allow students to move around and work either individually or in groups. It prevents them also from arranging seats so students can see each other. Other problems include the over crowdedness of classrooms, the fixity of desks, and the limitation of space.

### Conclusion

The findings of this study indicate that science teachers encounter strong barriers which obstruct their attempts at creative teaching. The teacher is expected to be familiar with the modern teaching methods that stimulate creative thinking of students. Only then will he be able to impart his knowledge most effectively and adequately to his students. There is a need for training through creativity course for pre- and in-service teacher and training must deal with creative science teaching skills.

Teaching science in Mysore is suggested to be based on competition among groups by using cooperative learning. Without competition, there will be no creativity. In Mysore, higher primary science teachers need to be creative in order to develop new instructions and activities, to adapt activities in the textbooks to special classroom environment and students' needs, to motivate students, and to cope with classroom management problems.

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